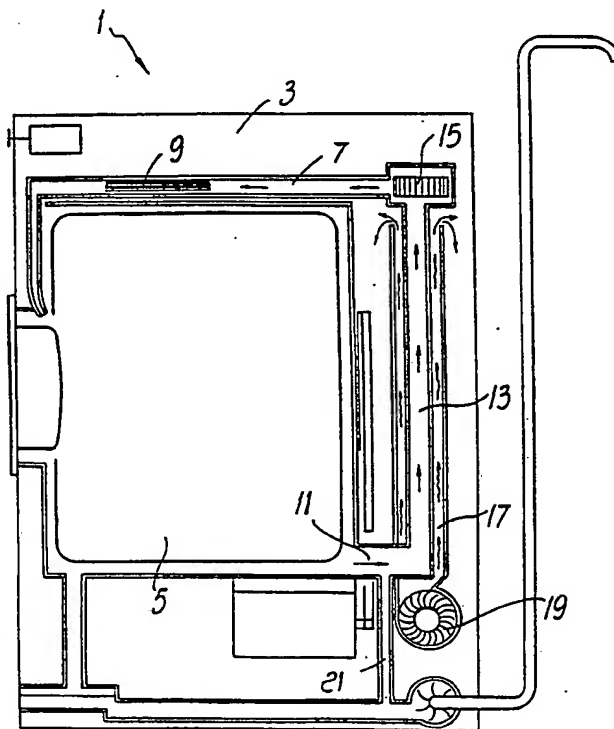




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : D06F 58/24	A1	(11) International Publication Number: WO 93/17169 (43) International Publication Date: 2 September 1993 (02.09.93)
(21) International Application Number: PCT/EP93/00112 (22) International Filing Date: 19 January 1993 (19.01.93) (30) Priority data: MI92A000404 25 February 1992 (25.02.92) IT (71) Applicant (for all designated States except US): ANTONIO MERLONI S.P.A. [IT/IT]; Via Vittorio Veneto, 116, I-60034 Fabriano (IT). (72) Inventor; and (75) Inventor/Applicant (for US only) : MERLONI, Antonio [IT/IT]; Via Vittorio Veneto, 116, I-60044 Fabriano (IT). (74) Agent: FORATTINI, A.; Internazionale Brevetti, Ingg. Zini Maranesi & C. S.r.l., Piazza Castello, 1, I-20121 Milano (IT).		(81) Designated States: JP, KR, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: WATER-SAVING DEVICE FOR WASHING-DRYING MACHINES**(57) Abstract**

A washing-drying machine equipped with a water-saving device including a duct (17) for cooling the air-circulation condenser (13). Consumption of water during the drying of the laundry is thus totally eliminated or substantially reduced.

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WATER-SAVING DEVICE FOR WASHING-DRYING MACHINES

The present invention relates to a water-saving device for washing-drying machines.

5

Machines termed washing-drying machines with closed-cycle air circulation are known which comprise an air circulation device which starts to operate at the end of the washing cycle and after spin-drying, for drying the laundry completely.

Various air circulation devices are known. In a first type, the air enters the tank, where the laundry is heated by a radiating element, removes the moisture, passes through the holes of the drum along the discharge ducts, and then rises up to the fan, which pushes the air back into the tank. The air, by passing through the warm laundry, removes the moisture and, by passing through the discharge duct, makes contact with the cooling water and consequently deposits the moisture. This cycle is repeated for approximately 100-120 minutes until the laundry is perfectly dry.

In a second type of known device, the air is pushed by a fan in contact with a resistor which heats it. The air is then fed into the drum, where, in contact with the wet laundry, it becomes loaded with moisture. This moisture-rich air then passes in a condenser, which is kept humid and cold by a jet of water, and deposits the moisture inside said condenser.

Other systems, which are substantially similar to those

described above, provide for the feeding of air and heat into the laundry, which yields its moisture to the air. The air is fed into a condenser (which is kept cold by water), where said air releases its moisture. By repeating the cycle for a
5 certain time, the laundry is dried.

An essential component of these drying systems is the condenser, where the air, in contact with the cold water, releases its moisture.

10 The condenser is generally constituted by a substantially vertical duct, wherein the current of warm and moist air coming from the lower end is intercepted by a film of water coming from the upper end. The film of water cools the warm air causing the condensation of the moisture.

15

The water also captures and removes the fluff, which has deposited on the duct walls. This fluff is then disposed of together with the discharge water.

20 The water thus acts as cooling means and as means for washing the condensation ducts in known drying systems.

Since in conventional machines the drying cycle is rather long, from at least 70 minutes up to 120 minutes, there is a
25 considerable consumption of water, generally from 40 to 70 liters for each drying cycle.

The aim of the present invention is to provide a washing-drying machine which has a considerably lower water
30 consumption than known machines.

This aim, these objects and others which will become apparent hereinafter are achieved by a water-saving device for washing-drying machines, which comprises a condenser element
5 connected to the tank of the machine, aspirator means connected to said condenser so that the moist air which is present in said tank is fed into said condenser and subsequently fed into said tank, characterized in that it comprises a cooling duct arranged adjacent to said condenser
10 element, and ventilation means adapted to generate a flow of air in said cooling duct so as to cool said condenser in order to condense the moisture of said air fed into said condenser.

15 Further characteristics and advantages will become apparent from the description of a preferred but not exclusive embodiment of the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

20 Figure 1 is a sectional side view of a washing-drying machine according to the invention, having an external cooling duct;

Figure 2 is a view, similar to the preceding one, of a machine according to another aspect of the invention, having
25 an internal cooling duct;

Figure 3 is a view, similar to the preceding one, of a machine according to a third aspect of the invention, having a dual internal and external cooling duct;

Figure 4 is a view, similar to the preceding ones, of a machine according to a fourth aspect of the invention, having a dual cooling duct and with an auxiliary condensation water device.

5

With reference to the above figures, a washing-drying machine 1 generally comprises a supporting structure 3 for a tank 5 containing the laundry to be washed and dried.

- 10 The drying and air circulation system comprises a hot-air delivery duct 7 and an electric resistor 9 for heating the air fed to the tank, in a per se known manner.

The machine comprises an aspiration duct 11 connecting the
15 tank 5 to a condenser 13. Condenser 13 is connected to an aspirator 15 and to the delivery duct 7, in a per se known manner.

A discharge duct 21 is connected to the tank 5, in order to
20 discharge the water, and to the condenser 13.

With particular reference to figure 1, the machine according to the invention comprises a cooling duct 17 which is external and coaxial to the condenser 13. The duct 17 has a
25 fan 19 for generating an air current in the cooling duct.

Figures 2-4 illustrate different embodiments of the water-saving device according to the invention, which is based on the elimination or substantial reduction of the use of water
30 to cool the condenser. The same numerals designate common or

substantially similar elements in the different embodiments illustrated.

Figure 2 illustrates a machine 101, substantially identical
5 to the machine 1, wherein the cooling duct 117 is internal and coaxial to the condenser 113.

Figure 3 illustrates a machine 201, similar to the preceding ones and having a dual cooling duct. The dual cooling duct is
10 constituted by an external duct 217a and by an internal duct 217b. Both ducts 217a, 217b are coaxial to the condenser 213.

Figure 4 instead illustrates a machine 301 having a dual cooling duct 317, similar to the one of the machine shown in
15 Figure 3. Duct 317 is coaxial to the condenser 313 and comprises an auxiliary cooling device constituted by a nozzle 323 for generating a film of cooling water inside the condenser 313.

20 The described machines can also be equipped with a device, for cleaning the condenser and the discharge duct, for example, similar to the one described in the Italian patent no. 1217490 in the name of this same Applicant. Said device essentially comprises a jet of cleaning water with a
25 relatively high flow rate.

In practice it has been observed that the invention achieves the intended aim and objects, a saving device having been provided which allows an enormous reduction in water
30 consumption in washing-drying machines.

The cooling of the condenser by means of an air-circulation cooling duct, optionally with the aid of a reduced use of water in the condenser, allows to substantially reduce or
5 even completely eliminate the use of water during the drying of the laundry.

The device according to the invention is susceptible to numerous modifications and variations, all of which are
10 within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent elements.

The materials employed, as well as the dimensions, may
15 naturally be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included
20 for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

CLAIMS

1. Water-saving device for washing-drying machines, comprising a condenser element (13) connected to the tank (5) of the machine, aspiration means (15) connected to said
5 condenser so that the moist air which is present in said tank is fed into said condenser and then fed into said tank, characterized in that it comprises a cooling duct (17) arranged adjacent to said condenser element, and ventilation means (19) adapted to generate a flow of air in said
10 cooling duct so as to cool said condenser in order to condense the moisture of said air which is fed into said condenser.

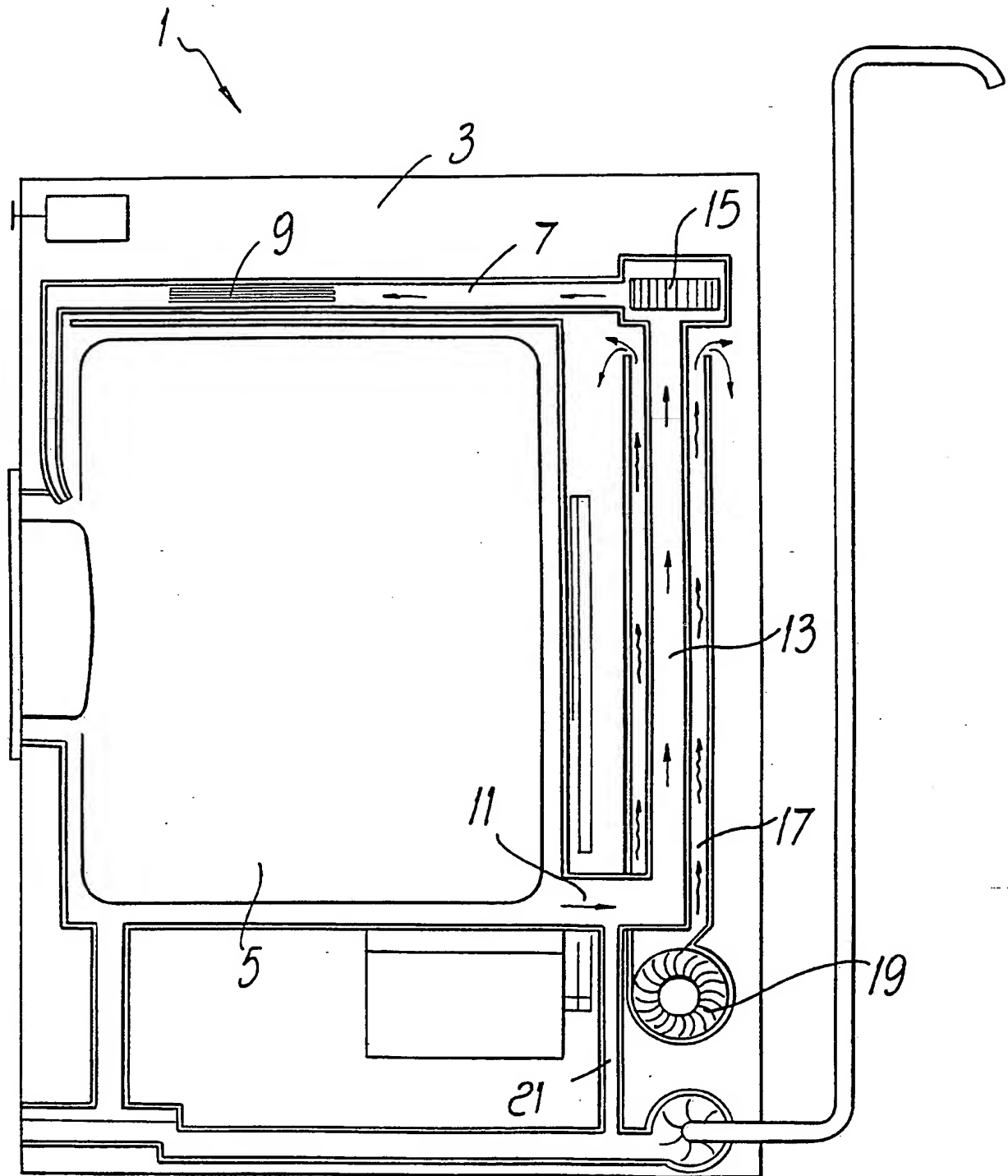
2. Device according to claim 1, characterized in that said
15 cooling duct (117) is coaxial and internal to said condenser (113).

3. Device according to claim 1, characterized in that said
cooling duct (17) is coaxial and external to said condenser
20 (13).

4. Device according to claim 1, characterized in that said
cooling duct is constituted by an internal tube (217b) coaxial to said condenser (213) and by an external tube
25 (217a) coaxial to said condenser (213).

5. Device according to claim 1, characterized in that it comprises an auxiliary condensation device (323) adapted to generate a thin film of water inside said condenser (313).

6. Device according to claim 1, characterized in that it comprises a discharge duct (21), said duct being connected to said tank (5) and to said condenser element (13), and characterized in that it comprises a device for cleaning said
5 discharge duct, said cleaning device comprising a jet of water fed into said discharge duct.

*FIG. 1*

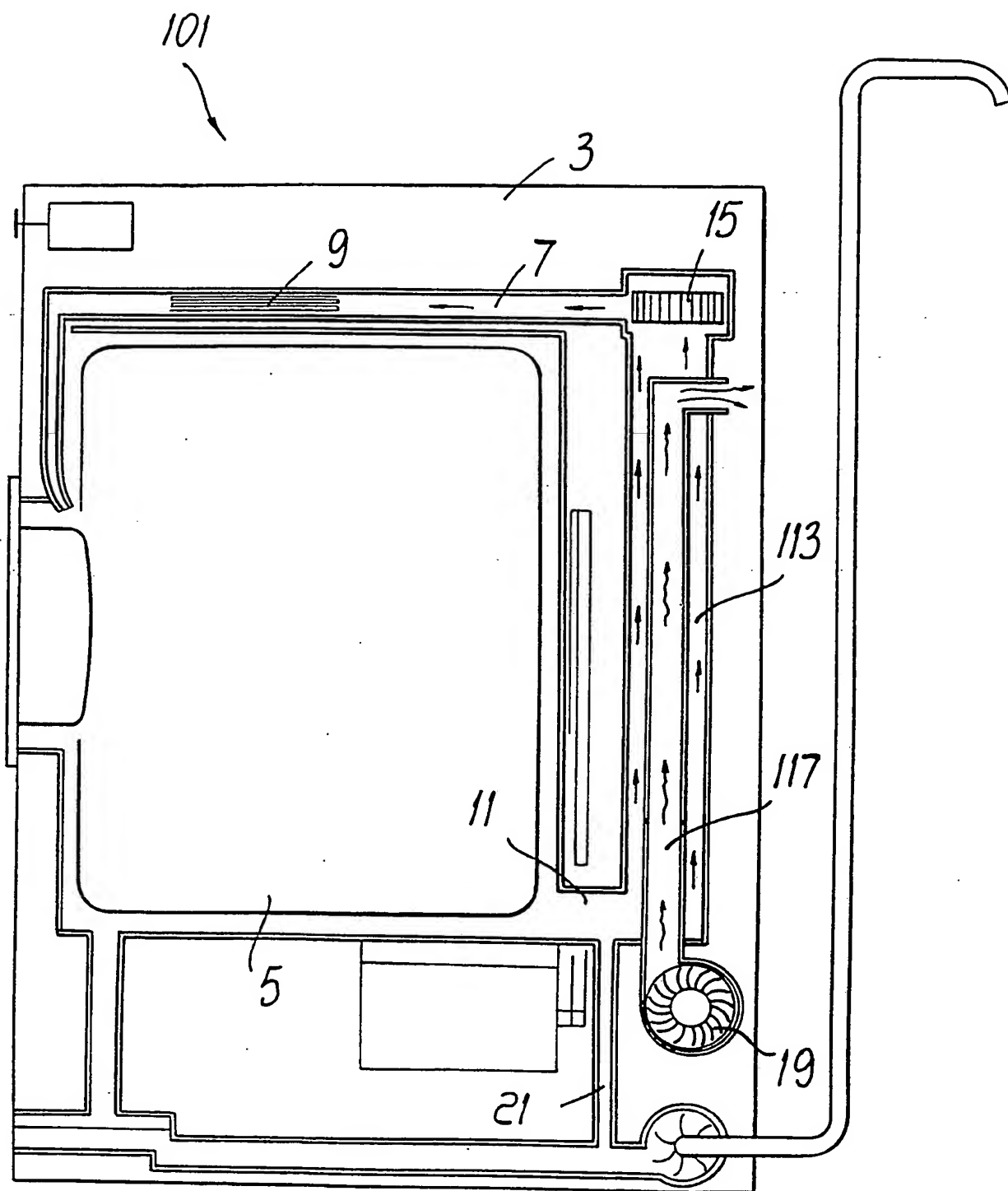


FIG. 2

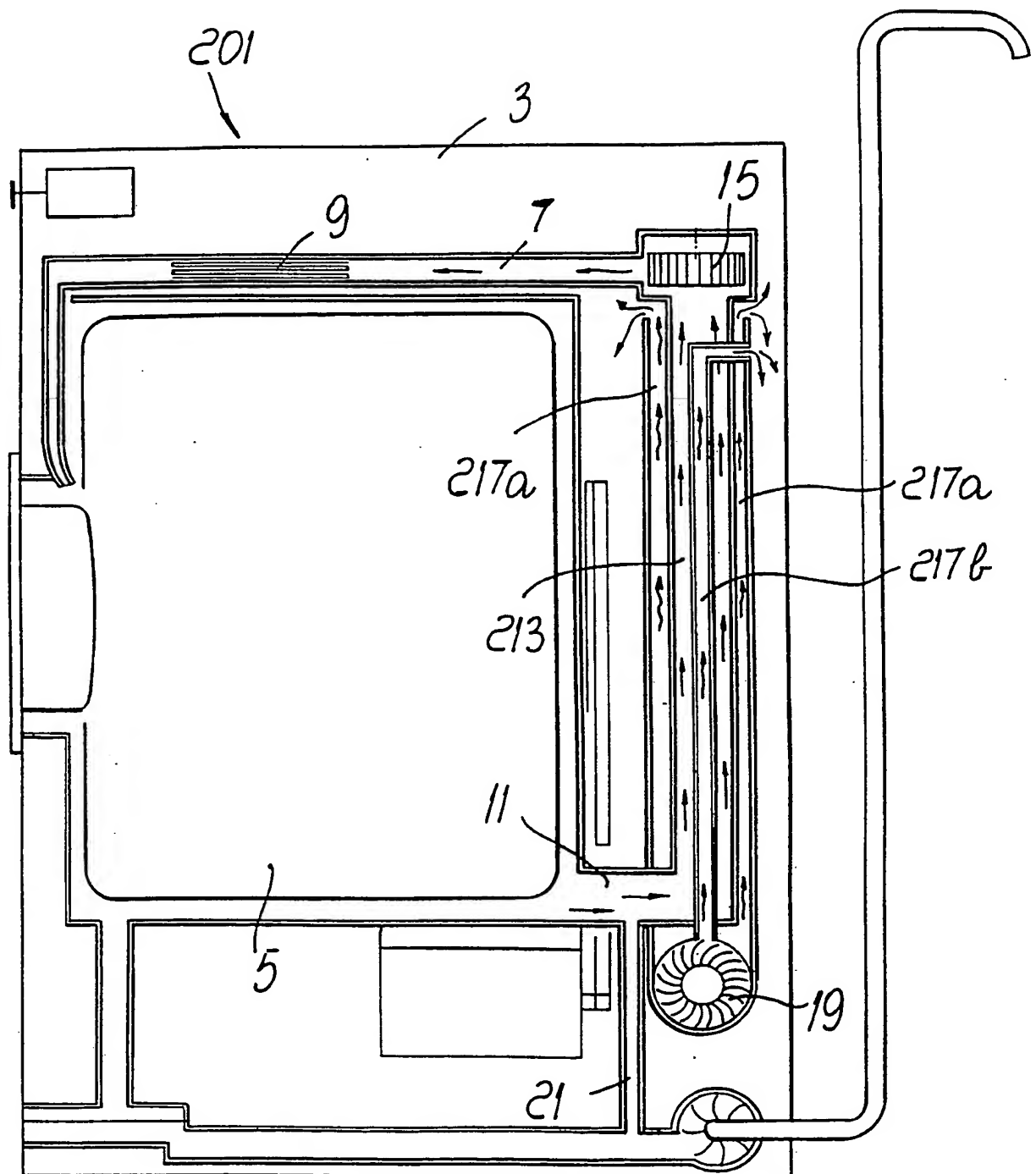


FIG. 3

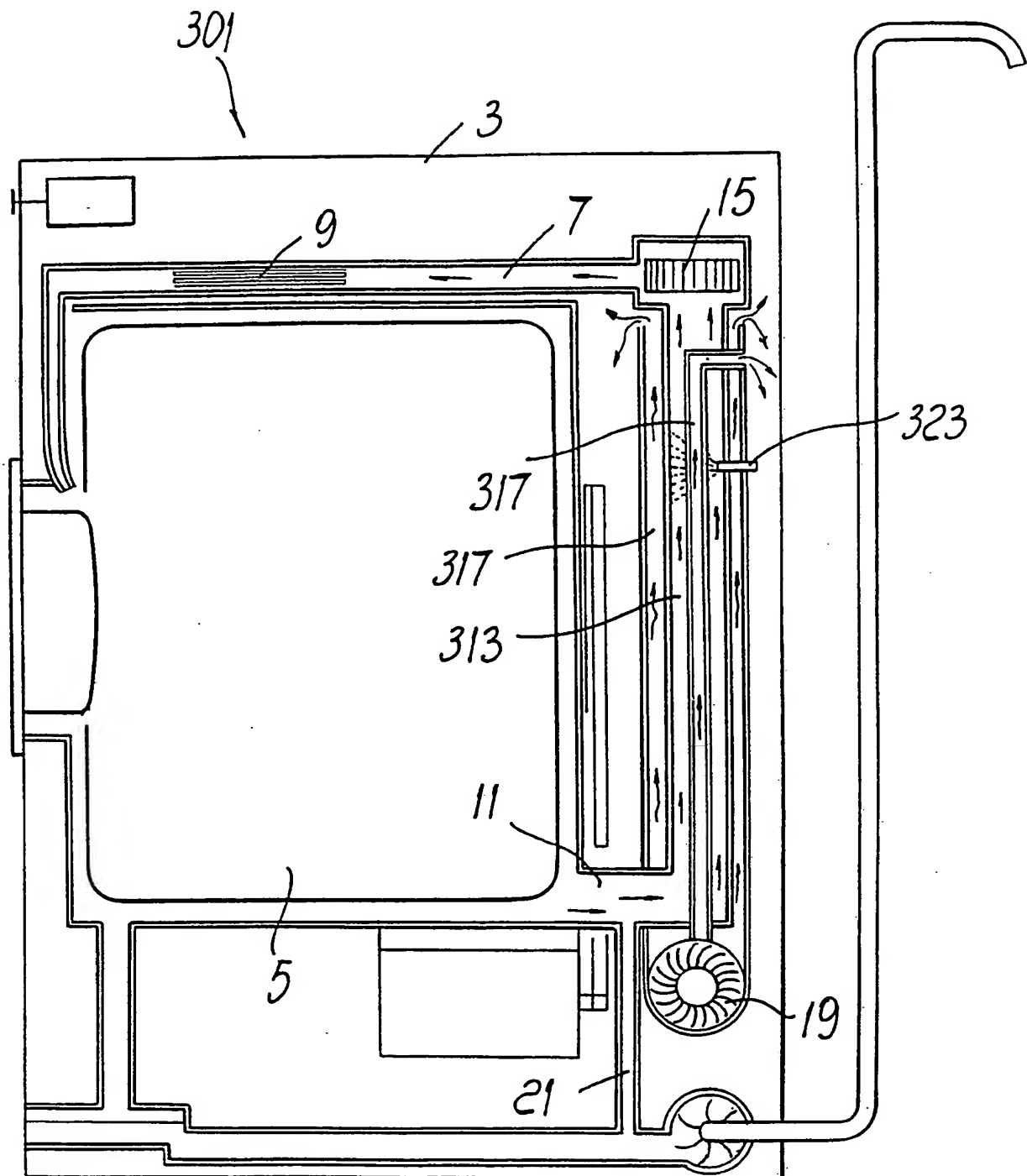


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 93/00112

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 D06F58/24		
II. FIELDS SEARCHED		
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Int.Cl. 5	D06F	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	WO,A,9 008 851 (ZANKER GMBH & CO) 9 August 1990 see claims; figures	1,2
X,P	EP,A,0 481 178 (ZANKER GMBH) 22 April 1992 see column 3, line 37 - column 4, line 5 see column 4, line 35 - column 5, line 28; figures	1-3
X	GB,A,2 097 519 (LICENTIA PATENT-VERWALTUNGS-GMBH) 3 November 1982 see the whole document	1
X	GB,A,2 026 147 (LICENTIA PATENT-VERWALTUNGS-GMBH) 30 January 1980 see abstract; figure	1
-/--		
¹⁰ Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search 17 MAY 1993		Date of Mailing of this International Search Report 04. 06. 93
International Searching Authority EUROPEAN PATENT OFFICE		Signature of Authorized Officer COURRIER G.L.A.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category ^a	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	DE,A,3 311 077 (LICENTIA PATENT-VERWALTUNGS-GMBH) 4 October 1984 see abstract; figures ---	1
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A	GB,A,1 247 788 (A. ZANUSSI S.P.A.) 29 September 1971 see the whole document -----	1,5,6

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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